

CLAIMS

1. A method for gasifying a solid material comprising:

5 a solution preparation step wherein a first solid material is dissolved in a solvent to prepare a gasification solution,

a solvent removal step wherein a second solid material is separated by removing the solvent used to prepare the gasification solution from that solution,
10 and

a solid sublimation step wherein the second solid material is gasified by sublimation.

2. A solid material gasification method as set forth in claim 1, wherein the solvent removal step and
15 the solid sublimation step are carried out sequentially in mutually independent treatment chambers.

3. A solid material gasification method as set forth in claim 2, wherein the treatment chamber of the solvent removal step and the treatment chamber of the
20 following solid sublimation step are arranged separated by an opening and closing partition.

4. A solid material gasification method as set forth in claim 1, wherein the solvent removal step and the solid sublimation step are carried out sequentially
25 in a single treatment chamber.

5. A solid material gasification method as set forth in claim 2, wherein the treatment chambers are composed of closed spaces.

6. A solid material gasification method as set forth in claim 2, wherein the gasification solution is
30 introduced into the treatment chamber in the form of fine droplets, and the solvent is removed within said treatment chamber.

7. A solid material gasification method as set forth in claim 1, wherein the second solid material is
35 adhered to a solid carrier in the form of a fine solid powder in the solvent removal step.

8. A solid material gasification method as set forth in claim 7, wherein the solid carrier is a porous material arranged within the treatment chamber.

5 9. A solid material gasification method as set forth in claim 8, wherein the porous material is made to move within the treatment chamber according to the progress of the treatment steps.

10 10. A solid material gasification method as set forth in claim 8, wherein the solid carrier is a porous inner wall of the treatment chamber.

11. A solid material gasification method as set forth in claim 7, wherein the solid carrier is composed of a porous metal material.

15 12. A solid material gasification method as set forth in claim 7, wherein the solid carrier is composed of a porous ceramic material.

20 13. A solid material gasification method as set forth in claim 1, wherein the solvent is selectively removed by heating the gasification solution to a temperature required for vaporization of the solvent.

14. A solid material gasification method as set forth in claim 1, wherein the second solid material is sublimated by heating to its sublimation temperature.

25 15. A solid material gasification method as set forth in claim 1, wherein reactive gas generated by sublimation of the second solid material is transferred to the next treatment step together with a carrier gas.

30 16. A solid material gasification method as set forth in claim 1, wherein the first solid material is composed of at least one type of organometallic compound.

35 17. A solid material gasification method as set forth in claim 16, wherein the organometallic compound is selected from the group consisting of $\text{Pb}(\text{DPM})_2$, $\text{Zr}(\text{DPM})_4$, $\text{Ti}(\text{iPrO})_2(\text{DPM})_2$, $\text{Ba}(\text{DPM})_2$, $\text{Sr}(\text{DPM})_2$, $\text{Ta}(\text{O-Et})_4$ and $\text{Bi}(\text{DPM})_3$.

18. An apparatus for gasifying a solid material comprising:

a solvent removal chamber provided with an inlet port of a gasification solvent containing a first solid material and a solvent in which it is dissolved, a heating device that vaporizes the solvent used to prepare the gasification solution by heating that solution, and an exhaust port that removes the vaporization product of the solvent, and

a solid sublimation chamber either also used as the solvent removal chamber or arranged communicably adjacent to it, and provided with a heating device that gasifies a second solid material separated by removal of the solvent by sublimation.

19. An apparatus for gasifying a solid material as set forth in claim 18, wherein the solvent removal chamber and the following solid sublimation chamber are arranged to be separated by an opening and closing partition.

20. An apparatus for gasifying a solid material as set forth in claim 18, wherein the combination solvent removal/solid sublimation chamber is provided with a heating device capable of adjusting the heating temperature to vaporize the solvent used prepare the gasification solution by heating it, and gasify the second solid material by sublimation.

21. An apparatus for gasifying a solid material as set forth in claim 18, wherein the solvent removal chamber and the solid sublimation chamber, or the combination solvent removal/solid sublimation chamber, are respectively composed of closed spaces.

22. An apparatus for gasifying a solid material as set forth in claim 18, wherein the solvent removal chamber or combination solvent removal/solid sublimation chamber is provided with a dissemination means that introduces the gasification solution in the form of fine droplets.

23. An apparatus for gasifying a solid material as set forth in claim 18, wherein the solvent removal

chamber or the combination solvent removal/solid sublimation chamber additionally has a carrier solid to which the second solid material is adhered in the form of fine solid particles.

5 24. An apparatus for gasifying a solid material as set forth in claim 23, wherein the solid carrier is a porous material arranged in the solvent removal chamber.

10 25. An apparatus for gasifying a solid material as set forth in claim 24 additionally having a transport means that moves the porous material from the solvent removal chamber to the solid sublimation chamber.

15 26. An apparatus for gasifying a solid material as set forth in claim 23, wherein the solid carrier is a porous inner wall of the combination solvent removal/solid sublimation chamber.

 27. An apparatus for gasifying a solid material as set forth in claim 23, wherein the solid carrier is composed of a porous metal material.

20 28. An apparatus for gasifying a solid material as set forth in claim 23, wherein the solid carrier is composed of a porous ceramic material.

25 29. An apparatus for gasifying a solid material as set forth in claim 18, wherein the solid sublimation chamber or combination solvent removal/solid sublimation chamber is additionally provided with a carrier gas inlet for transferring reactive gas generated by sublimation of the second solid material to a following treatment chamber.

30 30. An apparatus for gasifying a solid material as set forth in claim 18, wherein the first solid material is composed of at least one type of organometallic compound.

35 31. An apparatus for gasifying a solid material as set forth in claim 30, wherein the organometallic compound is selected from the group consisting of $\text{Pb}(\text{DPM})_2$, $\text{Zr}(\text{DPM})_4$, $\text{Ti}(\text{iPrO})_2(\text{DPM})_2$, $\text{Ba}(\text{DPM})_2$, $\text{Sr}(\text{DPM})_2$, $\text{Ta}(\text{O-Et})_4$ and $\text{Bi}(\text{DPM})_3$.

32. A process of forming a thin film comprising:
a solution preparation step wherein a
first solid material is dissolved in a solvent to prepare
a gasification solution,

5 a solvent removal step wherein a second
solid material is separated by removing the solvent used
to prepare the gasification solution from that solution,

a solid sublimation step wherein a
reactive gas is generated by sublimating the second solid
10 material, and

a film formation step wherein the thin
film is deposited on a treated substrate by using the
reactive gas as raw material.

33. A process of forming a thin film as set forth
15 in claim 32, wherein the reactive gas is generated by a
gasification method described in any one of claims 2 to
17.

34. An apparatus for forming a thin film from a
solid material comprising:

20 a solvent removal chamber provided with an
inlet port of a gasification solvent containing a first
solid material and a solvent in which it is dissolved, a
heating device that vaporizes the solvent used to prepare
the gasification solution by heating that solution, and
25 an exhaust port that removes the vaporization product of
the solvent,

a solid sublimation chamber either also
used as the solvent removal chamber or arranged
communicably adjacent to it, and provided with a heating
30 device that gasifies a second solid material separated by
removal of the solvent by sublimation, and

a film formation chamber wherein the thin
film is deposited on a treated substrate using as raw
material the reactive gas generated from the second solid
35 material in the solid sublimation chamber or combination
solvent removal/solid sublimation chamber.

35. An apparatus for forming a thin film from a

solid material as set forth in claim 34 provided with a gasification apparatus as set forth in any one of claims 19 to 31.